

# **Operator's Manual**



---

**APRICORN**



**Apricorn**  
**Parallel Printer Interface**  
for the Apple ][  
and Apple ][e Computers

**Operator's Manual**



## Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
<b>2</b>	<b>Installation</b>	<b>7</b>
	Removing the Cover	7
	Inserting the Parallel Interface	9
	Installation Check	12
<b>3</b>	<b>Using the Parallel Interface</b>	<b>15</b>
	Integer and Applesoft BASIC	15
	Apple Pascal and FORTRAN	16
	CP/M Operating System	17
	Commercial Software	18
<b>4</b>	<b>Controlling the     Parallel Interface</b>	<b>21</b>
	Printer Commands	21
	OPTION Switch Settings	25
<b>5</b>	<b>Trouble Shooting</b>	<b>29</b>
<b>6</b>	<b>Technical Information</b>	<b>33</b>
	Calling the Firmware Directly	33
	Directly Accessing the Printer Port	33
	Reading the OPTION Switches	34
	Cable Assembly Pinout	35
	Parts List	36
<b>7</b>	<b>Warranty</b>	<b>39</b>



## Introduction

The Apricorn Parallel Printer Interface for the Apple ][ computer is a plug-in circuit board and interface cable that allows you to produce hard copy output on any Centronics compatible parallel printer. Now you can easily send data to your printer to produce program listings, word processing text, financial spreadsheets/reports and debug listings.

The Parallel Printer Interface is compatible with the Apple Parallel Printer Interface Card and works with all Apple operating systems including DOS 3.3, Integer and Applesoft BASIC, Apple Pascal and FORTRAN, Apple PILOT, Apple Logo and all CP/M operating systems (Microsoft, ALS and PCPI). Also, all software packages are compatible with the Parallel Printer Interface.

Using the Parallel Printer Interface's built-in intelligence you can control printer line length, linefeed output, video screen echo and 7 or 8-bit output port. The default setting of all options is controlled via an on-board OPTION switch.

The Parallel Printer Interface is backed with a full lifetime warranty. This means for as long as you own the product, if it fails, it will be repaired or replaced free of charge.

[Faint, illegible text spanning the middle of the page, likely bleed-through from the reverse side.]

## **Installation**

This section will provide step by step instructions for installing the Parallel Printer Interface in your Apple ][ computer. Please read this entire section before attempting to install the interface to familiarize yourself with the overall procedure, then perform each step in order exactly as detailed. Installation should be simple if care and caution are used.

### **WARNING**

Attempting to insert or remove any peripheral boards in your Apple ][ or Apple ][e computer while the power is on will result in damage to the peripheral boards and the Apple computer. Be sure to turn off the power to your Apple computer before performing any of the installation steps in this section.

### **Removing the Cover**

1. Turn off the power to your Apple ][. The POWER light in the lower left corner of the keyboard should not be illuminated.
2. Remove the cover from your Apple ][ by pulling up on the rear corners of the cover until a slight pop is heard. Pull up enough to separate the fasteners, then stop.
3. Slide the cover rearward away from the Apple ][. You should now be able to see the interior of your Apple ][.

4. Position your Apple ][ computer comfortably in front of you with the keyboard nearest you. Familiarize yourself with the various interior components of the Apple ][ computer. See Figure 1 for details. These will be referred to in later installation steps.

#### Interior of Apple ][ Computer

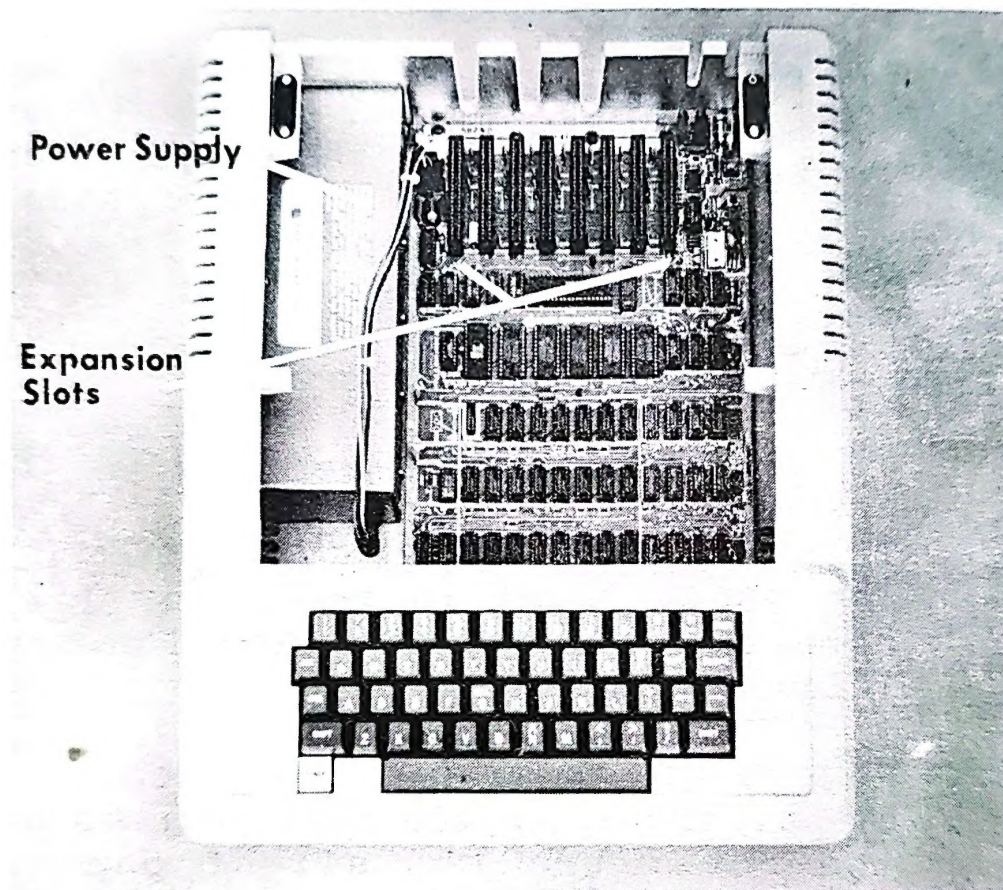


Figure 1

## Inserting the Parallel Interface

The Parallel Printer Interface plugs into one of the Slots on the Apple ][ motherboard. Slot 1 through Slot 7 can be used for the Parallel Interface; however, Slot 1 is recommended as certain operating systems and software require the printer to be in Slot 1.

1. Examine the Parallel Printer Interface and cable assembly in detail. See Figure 2 for details. Notice the various parts of the circuit board and cable assembly. These will be referred to in later installation steps.

### Parallel Printer Interface

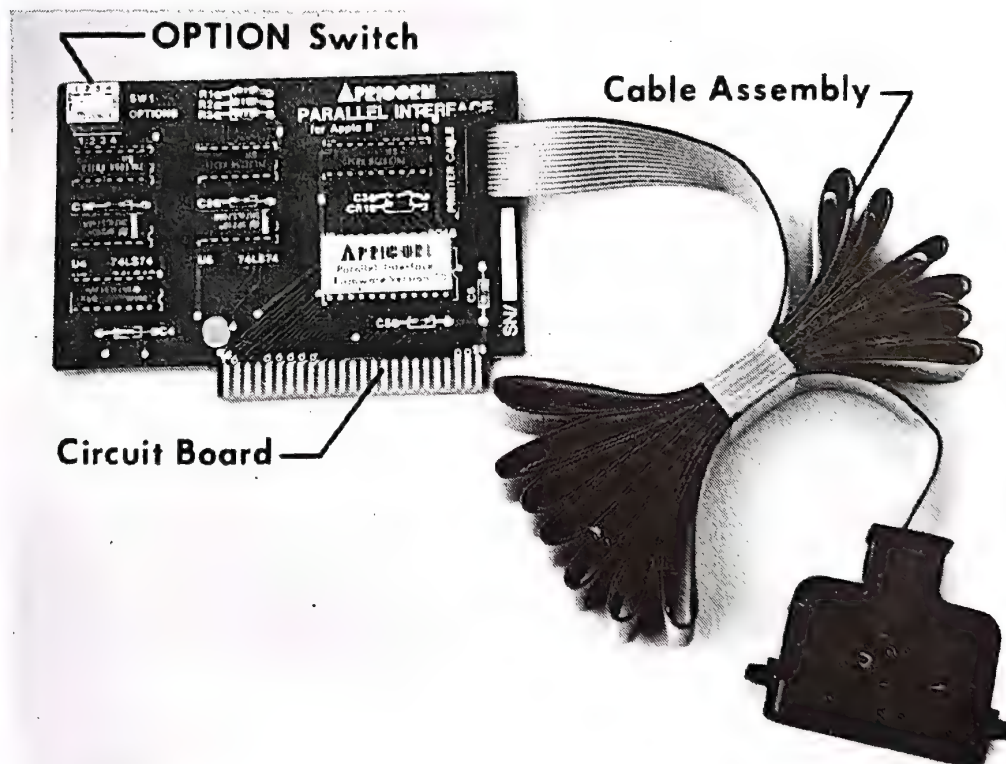


Figure 2

2. Locate Slot 1 on the Apple ][ or Apple ][e computer. There are eight edge card connectors at the rear of the Apple ][ numbered from 0 to 7 (on an Apple ][e, there are seven numbered from 1 to 7). The lowest numbered Slot is on the left (nearest the power supply box) and the highest is on the right. The Parallel Printer Interface can actually be installed in Slot 1 through 7; however, Slot 1 is recommended due to various operating system and software requirements. All further references will assume the card is installed in Slot 1.
3. Insert the Parallel Printer Interface into Slot 1. Press firmly with a slight rocking motion from front to back until the card is fully seated into the edge card connector.
4. Drape the cable over the back of the case, with the lid off. See Figure 3 for details. Give the cable enough slack so that it will not pull on the installed circuit card once the lid is installed.

## Inserted Parallel Printer Interface

Routed Cable Assembly

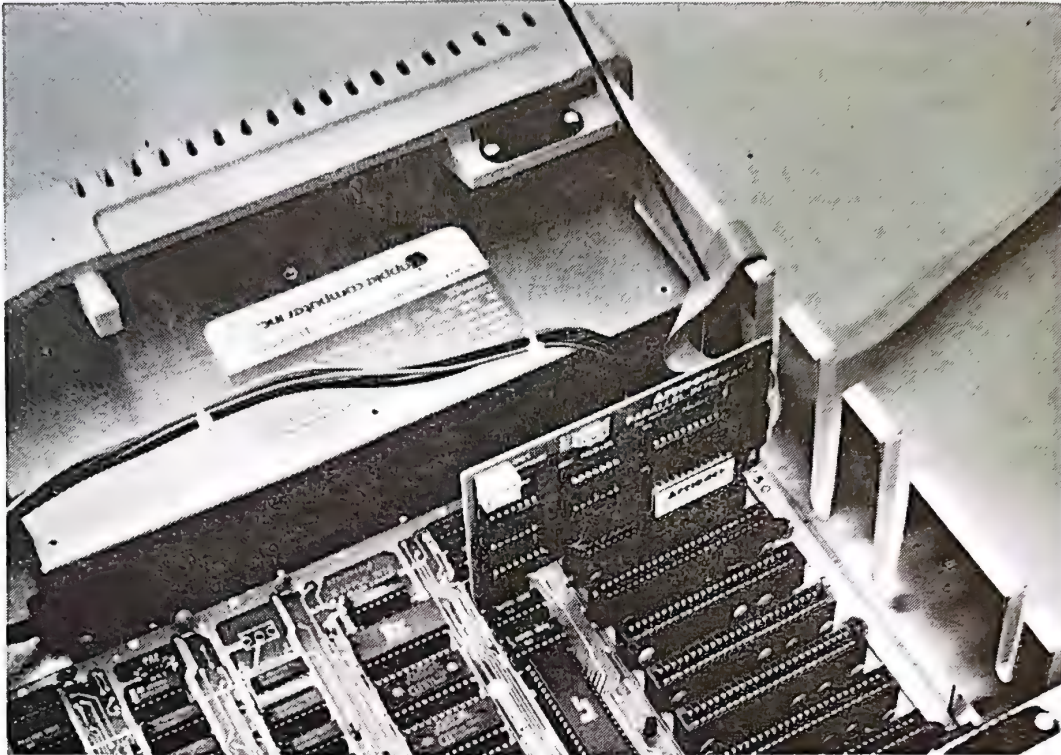


Figure 3

5. Replace the cover on your Apple ][. Slide the cover from the rear towards the Apple ][ keyboard and when the cover is in place press down on the rear corners of the cover until the fasteners snap into place. The pressure between the cover and the case acts as a cable assembly clamp, preventing a tug on the cable from putting undue stress on the connector or Parallel Printer Interface circuit card.

6. Connect the cable assembly to your printer. Position your printer in a convenient location. Route the Parallel Printer Interface cable to your printer and insert the 36 pin Centronics plug into the 36 pin Centronics receptacle. The bail locks can be snapped into place to secure the cable assembly to the printer.
7. Recheck the installation of the Parallel Printer Interface and cable assembly. You may want to reread the installation instructions.
8. The Parallel Printer Interface is now installed and ready to use.

### **Installation Check**

In order to check the proper installation of your Parallel Printer Interface, turn your Apple ][ and printer on. Type PR#1 and hit RETURN a few times. The Applesoft or Integer prompt character should be printing on your printer. If this is not occurring, double check the installation steps, and if neccessary consult the Trouble Shooting section.





## Using the Parallel Interface

This section will describe how to access your printer using the Parallel Printer Interface under different operating systems used on the Apple ][ computer. These will include Integer and Applesoft BASIC under DOS 3.3, Apple Pascal and FORTRAN, CP/M and commercial software packages.

### Integer and Applesoft BASIC

Since every Apple ][, Apple ][+ or Apple ][e comes with Integer or Applesoft BASIC in ROM (Read Only Memory), most of you will be using the Parallel Printer Interface under this operating system.

Under BASIC, the Apple ][ recognizes eight different I/O (Input/Output) devices. One of these devices, the keyboard and display device, is built into the Apple ][. The other seven devices are any and all I/O cards that go in Slots 1 - 7. The Parallel Printer Interface is an output only device that usually resides in Slot 1. A command can be given to direct output to any one of these eight devices at a given time. This is done with the PR#n command, where n is the number of the device from 0 to 7. The video screen is defined as device 0 and the printer is device 1 (if it is installed in Slot 1).

To direct output to the printer, simply type the command PR#1<RETURN> (whenever you see <RETURN>, hit the RETURN key) from the keyboard. You should now see all

output being printed on the printer. To turn off the printer type PR#0<RETURN>. This returns all output to device 0, the Apple ][ video screen.

To perform this action under program control it is slightly different. The PR#n command is really a DOS command so it must be printed preceded with the DOS character CTRL-D. For example, this short BASIC program will turn the printer on and print a short message, then turn the printer off.

```
100 D$ = "": REM CTRL-D
110 PRINT D$; "PR#1"
120 PRINT "HELLO, I AM A PRINTER"
130 PRINT D$; "PR#0"
140 END
```

For more information on selecting I/O devices refer to page 100 of "The DOS Manual" by Apple Computer, Inc.

### **Apple Pascal and FORTRAN**

These two programming languages are grouped together as they both run under the Apple Pascal operating system. The Parallel Printer Interface must be installed in Slot 1 to be recognized as a printer under the Pascal operating system.

In both of these programming languages all devices are treated like character oriented files. The operating system has reserved certain filenames for specific devices like the keyboard, the video screen and the printer. The reserved name

for the printer is "PRINTER:" and the use of this special filename will result in the data being sent to the printer, not a disk file of that name. For more information on I/O devices refer to page 26 of the "Apple Pascal Operating System Reference Manual" by Apple Computer, Inc. For information on printer output from within a FORTRAN program refer to pages 78 to 82 of the "Apple FORTRAN Language Reference Manual" by Apple Computer, Inc.

### **CP/M Operating System**

There are a few companies providing the CP/M operating system for the Apple ][ computer. As far as the Parallel Printer Interface is concerned, all of the different CP/M systems are identical. They all require that the Parallel Printer Interface be installed in Slot 1.

The Parallel Printer Interface is accessed as the LST: device. For example you can use PIP (Peripheral Interchange Program) to send a disk file to the printer by typing PIP LST:=LETTER.TXT<RETURN>. In command mode, all output to the video screen can be diverted to the printer by typing CTRL-P. Type CTRL-P again to return the output to the video screen.

Under Microsoft BASIC, you can send data to the printer by using the LPRINT statement. If you need more detailed information on accessing your printer under CP/M, refer to the documentation that came with your system.

## Commercial Software

Software packages available in retail outlets such as word processing and spreadsheet programs which send data to a printer will automatically do this for you. Some software packages will allow the printer interface to be in any Slot; however, most come initially configured for a Slot 1 installation. In any case, if you have problems communicating with your printer, refer to the documentation that came with your software package or the Trouble Shooting section of this manual.





## **Controlling the Parallel Interface**

The Parallel Printer Interface is an intelligent Apple ][ peripheral. The onboard ROM firmware allows you to easily control various functions of the interface. This is done by sending printer commands via special control codes. The default setting of each function can also be configured with the onboard OPTIONS switch.

### **Printer Commands**

Various commands can be sent to the Parallel Printer Interface to turn the printer on or off, turn video echo on or off (and set printing width), turn the linefeed on or off, clear or set the 8th bit (MSB) and change the current command character.

In the explanations detailing the printer command control codes, follow these rules:

Upper case characters - Type the characters or numbers shown.

Lower case characters - Enter the data identified by the word.

CTRL (control) characters - Type the control character by depressing the <CTRL> key and the letter key simultaneously (similar to using the shift key).

Spaces - Spacing in the command explanation is for legibility only. Spaces need not actually be entered.

<RETURN> - This means to press the key marked RETURN.

Here is a list of all printer commands that the Parallel Printer Interface will recognize. The actual command is first, followed by the explanation, then an example in Applesoft BASIC.

PR#n <RETURN>	Send all subsequent output to the printer in Slot n. This command must be given before any commands listed below will be recognized by the Parallel Printer Interface.
------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------

```
100 PRINT CHR$(4)"PR#1"
```

This program line turns on the Parallel Printer Interface in Slot 1.

PR#0 <RETURN>	Turns off the Parallel Printer Interface and returns all subsequent output to the Apple ][ video screen only.
------------------	---------------------------------------------------------------------------------------------------------------

```
100 PRINT CHR$(4);"PR#0"
```

CTRL-InN <RETURN>	Turns off the video echo and prints n characters per line on the printer.
----------------------	---------------------------------------------------------------------------

```
100 PRINT CHR$(9);"80N"
```

This program line turns off the video echo and sets the print width to 80 columns.

CTRL-II                      Turns video echo back on  
<RETURN>                   and resets the printing  
                             width to 40 columns.

100 PRINT CHR\$(9);"I"

CTRL-IK                      Turns the linefeed that is  
<RETURN>                   added after carriage returns  
                             on/off.

100 PRINT CHR\$(9);"K"

CTRL-IH                      Allows the 8th bit (MSB) to  
<RETURN>                   be output to the printer  
                             port. On some printers this  
                             allows the alternate charac-  
                             ter set to be printed. On  
                             other printers this will have  
                             no effect.

100 PRINT CHR\$(9);"H"

Note: Option switch #4 on  
the Parallel Printer  
Interface must be set in the  
OFF position to allow use of  
this function. Refer to the  
section on OPTION switch  
settings for more  
information.

CTRL-IX                      Clear the 8th bit (MSB) to be  
                             output to the printer port.

100 PRINT CHR\$(9);"H"

CTRL-I                   Changes the printer command  
CTRL-letter           lead-in character from CTRL-I  
<RETURN>               to CTRL-letter.   Printer  
                          commands imbedded in a BASIC  
                          program will be treated as  
                          such when listed unless this  
                          is done before the listing.

```
100 PRINT CHR$(9);CHR$(1)
```

This program line changes the  
printer command character  
from CTRL-I to CTRL-A.

CTRL-letter           Changes the printer command  
CTRL-I                character back to CTRL-I.  
<RETURN>

```
100 PRINT CHR$(1);CHR$(9)
```

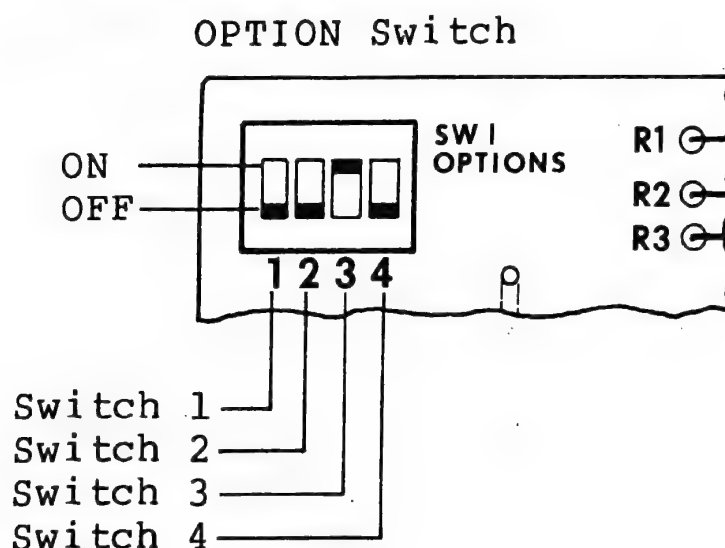
This program line restores  
the printer command character  
back to CTRL-I.

All of these commands can be typed from  
the keyboard or executed in PRINT  
statements. If they are typed from the  
keyboard a SYNTAX ERROR will follow all  
CTRL-I printer commands. This is a normal  
condition.

## OPTION Switch Settings

A special feature on the Parallel Printer Interface is the ability to set the default values of the interface functions via an onboard OPTION switch. This allows you to set up your system the way you need it and not have to change various firmware options with a software command every time the printer is accessed.

This section will describe the OPTION switch and what each of the four switches mean.



Switch 1 - This switch controls video echo and print width. In the OFF position, the Parallel Printer Interface will echo all output to the video screen and sets a 40 column print width. In the ON position, there will be no video echo and an 80 column print width is set. The setting of this switch from the factory is OFF.

Switch 2 - This switch controls the linefeed function. In the OFF position, the Parallel Printer Interface will add a linefeed after every carriage return. In the ON position, no linefeed will be added. The setting of this switch from the factory is OFF.

Switch 3 - This switch controls the 8th bit (MSB) on the printer port in software. In the OFF position, the 8th bit is allowed to be output to the printer port. In the ON position, the 8th bit is cleared before it is sent to the printer port. The setting of this switch is valid only if Switch 4 is in the OFF position (see below). The setting of this switch from the factory is ON.

Switch 4 - This switch controls the 8th bit (MSB) on the printer port in hardware. In the OFF position, the 8th bit is allowed to pass through. In the ON position, the 8th bit is grounded and is always low. The setting of this switch from the factory is OFF.

Apple Pascal and the CP/M operating system do not use the firmware driver on the Parallel Printer Interface as they access the hardware on the card directly. This means that you cannot use any of the printer commands and the first three OPTION switch settings will have no effect under these operating systems. OPTION switch #4 will still be effective as it is tied into the hardware on the card.





## **Trouble Shooting**

This section is designed to help you solve some common problems in interfacing your printer to your Apple ][. Simply find your symptom and check every thing listed for that problem.

Symptom - After I type PR#1 the Apple ][ hangs up and the printer doesn't print.

If this occurs, check the following:

1. Is the printer turned on?
2. Is the printer on-line?
3. Is the Parallel Printer Interface in the correct Slot?
4. Is the cable firmly and properly attached to the printer?
5. Is the cable firmly plugged into the Parallel Printer Interface?
6. Is there paper properly fed into the printer?
7. If your printer supports both a serial and a parallel interface, is it set for parallel operation?

Symptom - The printer does not seem to be linefeeding properly. It is double spacing or overprinting on the same line.

The linefeed option on the Parallel Printer Interface and/or your printer is

not set properly. If the Parallel Printer Interface is set to add a line feed, then set your printer DIP switches to not add a linefeed after carriage return. If the Parallel Printer Interface is set to not add a linefeed, then your printer must be set to append its own linefeed after carriage return. Refer to the section on Controlling the Parallel Interface for more information.

Symptom - I am not able to access the alternate character set of my printer as the 8th bit must be set. I have tried the CTRL-IH command and it doesn't seem to work.

In order for the 8th bit to be accessed under software control, OPTION switch #4 must be OFF. If it is ON it physically grounds the 8th bit low. Refer to the section on Controlling the Parallel Interface for more information.

Symptom - I can't seem to get any of the printer commands to work. I type them as specified but they don't seem to be recognized.

First, the printer interface must be turned on and the printer on-line. The most common problem in typing the printer commands is the CTRL-I part. For example, in order to turn off the video echo and set an 80 column print width, CTRL-I80N must be issued.

1. Turn on the Parallel Printer Interface by typing PR#1<RETURN>.
2. Hold the CTRL key down.
3. Depress the I key. If you have an Apple ][e or an Apple ][ with a full upper/lower case keyboard, make sure the CAPS LOCK key is on or press the shift key while pressing the I key.
4. Release the I key, then the CTRL key.
5. Type the 8, then the Ø then the N key. Again, make sure you type an upper case N. Then hit RETURN.

After performing these steps the Parallel Printer Interface should stop all video echo and print 8Ø columns wide on the printer.

Symptom - The printer commands and OPTION switch settings don't seem to work under Apple Pascal and CP/M.

The Apple Pascal and CP/M operating systems utilize the hardware on the card with their own drivers, so the firmware on the card is ignored. OPTION switch #4 will still work as it is tied into the hardware on the card.

If this section didn't solve your problem contact the dealer from whom you purchased the card for assistance. If they can't solve your problem, call or write to:

Apricorn Technical Assistance  
7050 Convoy Court  
San Diego, CA. 92111  
(619) 569-9483

## **Technical Information**

The information contained in this section is highly technical and is intended for the advanced Apple ][ user. All address values are given in hexadecimal and some technical jargon is used. Proceed at your own discretion.

This section will describe how to call the firmware directly, how to access the printer port directly, how to read the OPTION switch, wiring pinouts for the cable assembly and a complete parts list.

### **Calling the Firmware Directly**

All output in the Apple ][ is channelled through an output vector on zero page. This vector is named CSW and is located at \$36 - \$37. The firmware on the Parallel Printer Interface is located in the peripheral card ROM space for the Slot that it is installed in. The first call to the firmware should be to \$Cn00 (n = Slot). Simply put \$00 into \$36 and \$Cn into \$37 and the next call for output will go through the Parallel Printer Interface firmware. The firmware will change the vector after its initial call to \$Cn02. All default values for the firmware control options are set on the initial call.

### **Directly Accessing the Printer Port**

If you wish more control over the printer than the firmware allows, then you can access the printer port directly.

The printer port is located at \$C080+\$n0 and a write operation to this address sends a byte of data to the printer. The STrobe signal is generated by the hardware. The ACK signal alters the ROM firmware address and location \$CnC1 can be checked for the handshake. If \$CnC1 contains an \$FE then the printer has not yet ACKnowledged the data. As soon as a \$26 can be read from \$CnC1 the printer has accepted the data.

The following subroutine example will output a character to the printer and then wait for the printer's ACK signal. The Parallel Printer Interface is assumed to be in Slot 1. The character is assumed to be in the A register.

```

                STA  C090          ;Send character
LOOP           LDA  C1C1          ;Wait for ACK
                BMI  LOOP
                RTS                ;Return to caller

```

### Reading the OPTION Switches

If your application needs to read the OPTION switch, then here is the address and how each switch maps to each bit.

OPTION switch address:      \$C081+\$n0

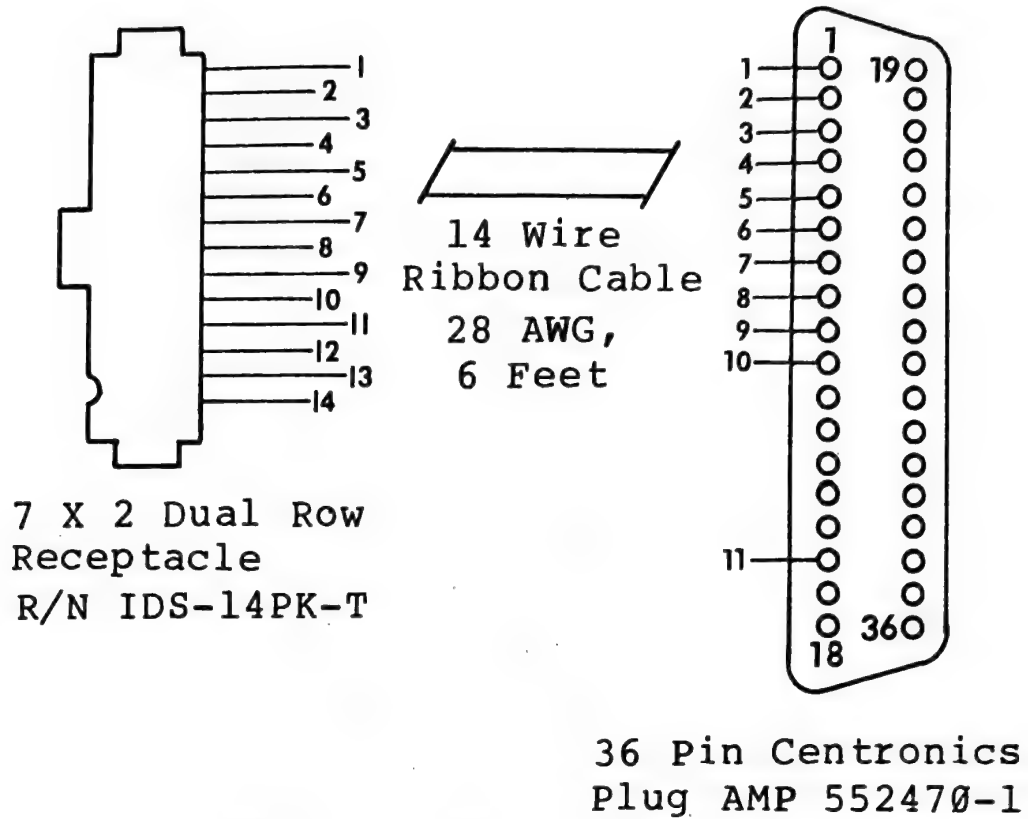
```

Switch 1 is bit 7 (MSB)      *-----
Switch 2 is bit 0 (LSB)      -----*
Switch 3 is bit 6            -*-----
Switch 4 cannot be read

```

The value of the bit read will be 0 if the switch is ON and 1 if the switch is OFF.

## Cable Assembly Pinout



### Wire Ribbon Number

### Signal Description

1	Data Strobe
2	Data 0
3	Data 1
4	Data 2
5	Data 3
6	Data 4
7	Data 5
8	Data 6
9	Data 7
10	Acknowledge
11,12,13,14	Ground

## Parts List

Here is a complete list and description of each part on the Parallel Printer Interface.

<u>Reference</u>	<u>Description</u>	<u>Quantity</u>
LS00	Quad NAND	1
LS74	Dual D Flip-Flop	2
LS125	Quad TS Buffer	1
LS139	Dual 1 of 4 Decoder	1
LS373	Octal TS Latch	1
2716	Firmware EPROM	1
R1-R3	4.7K Ohm 1/4W Res.	3
C1-C6	0.1 MF/50V Cap.	6
CR1	1N4001 Diode	1
SW1 OPTIONS	4 Pos. DIP Switch	1
----	Cable Connector	1
----	Cable Assembly	1
PN-1300-30	Circuit Board	1





## Warranty

Apricorn warrants the Parallel Printer Interface for the Apple ][ computer against defects in materials and workmanship for as long as the original purchaser owns the product.

The product will be repaired or replaced at the option of Apricorn. The warranty does not apply if the product has been damaged by accident, abuse, misuse or misapplication or has been modified in any way.

In order to obtain warranty service return the product to the Apricorn Service Department. Attach to the product your name, address, telephone number, description of the problem and a bill of sale as proof of original retail purchase.

Ship the product prepaid and insured to:

Apricorn Service Department  
7050 Convoy Court  
San Diego, CA 92111

Apricorn shall have no liability or responsibility with respect to the merchantability or fitness of the product for a particular purpose. Apricorn is not liable or responsible for any direct, indirect, incidental or consequential damages arising out of the use of this product. This warranty does not extend to any other products used in conjunction with this product and is limited to the repair or replacement of the product.

